

ANT LARVAE OF THE SUBFAMILY MYRMICINAE:
SECOND SUPPLEMENT ON THE TRIBES
MYRMICINI AND PHEIDOLINI

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ABSTRACT

The authors' first supplement on ant larvae of the subfamily Myrmicinae was published in 1960. The present supplement deals with the tribes Myrmicini and Pheidolini only and contains descriptions of the larvae of 24 additional species in the genera *Aphaenogaster*, *Machomyrma*, *Manica*, *Myrmica*, *Novomessor*, *Pheidole*, *Pogonomyrmex*, *Stenamma* and *Veromessor*. The genus *Machomyrma* is characterized here for the first time. A key to the genera is included.

Key Words: Immatures, taxonomy, *Aphaenogaster*, *Machomyrma*, *Manica*, *Myrmica*, *Novomessor*, *Pheidole*, *Pogonomyrmex*, *Stenamma*, *Veromessor*.

Subsequent to the publication of our first supplement (1960a)¹ for the larvae of the subfamily Myrmicinae we have collected or received from other myrmecologists so much additional material that it has become necessary to publish another supplement.

TRIBE MYRMICINI
Genus MYRMICA Latreille
Myrmica emeryana Forel

ADDITION to description of labium (1952: 115). An isolated sensillum between each palp and the opening of the sericteries.

Myrmica rubra (Linnaeus)

Brian 1950-1967—Numerous papers treating of the care of brood, of the interrelations between adults and brood and of caste determination. We have not

¹ To save space we refer to our previous descriptions by date only. The complete references are to be found in the Literature Cited.

read any of them for the reason given by Weaver (q.v.). Any one interested in these topics is advised to consult Weaver or Sudd (1967) or Wilson (1971).

Weaver (1966) has given an excellent review of some of Brian's papers. One of his comments is pertinent; "Caste determination in *Myrmica rubra* has been studied by Brian and reported in language that is almost aggressively obscure" (p. 91).

Weir 1957, 1959a, 1959b and 1959c—See titles.

Wheeler, G. C. and J. 1952: 118-125—We gave the date of Swammerdam's *Historia Insectorum Generalis* as 1693; it should be changed to 1669.

Myrmica strioligaster Cole

Length (through spiracles) about 5.2 mm. Similar to *M. emeryana* Forel (1952: 114) except in the following details. Body hairs of 2 types: (1) 0.025-0.23 mm, denticulate, a few on each somite; (2) 0.175-0.2 mm, with flexuous shaft and short anchor-tip. Head hairs 0.05-0.125 mm long, denticulate. Anterior surface of each half of labrum with eight minute hairs and/or sensilla; posterior surface with four sensilla on each half; entire posterior surface with minute spinules in transverse rows. Mandibles with the medial border highly varied but similar to *M. emeryana*. (Material studied: six larvae from Arizona, courtesy of Dr. A. C. Cole.)

Genus PARAMYRMICA Cole

Paramyrmica colax Cole

Gregg 1961: 214—"Dr. and Mrs. G. C. Wheeler (1959) have studied and described the larva of *Paramyrmica colax* and found it to be closely related to that of *Myrmica*. However, they showed that the former is generically different from *Myrmica* because it lacks the anchor-tipped hairs and by the similarity of head and body hairs."

Genus *Manica* Jurine

Mature larvae show variation in shape of the neck from tapered to thickened, with a constriction at abdominal somites I and II. Our figure (1960: pl. I, fig. 5) is intermediate in constriction. Immature larvae have a sac-like swollen abdomen with an abruptly narrowed neck (=thoracic somites). The neck shows segmentation but the abdomen is so swollen that the segmentation is indistinct or lacking.

G. C. and J. Wheeler 1970: 133—The larvae of *Myrmica* have anchor-tipped hairs; the larvae of *Manica* do not.

Manica bradleyi (Wheeler)

(Fig. 7)

SUBMATURE LARVA: Length (through spiracles) 5.6-7 mm. Similar to *Manica mutica* (1960a: 5) except as follows. Thorax and AI forming a neck (stout to slender) which is distinctly marked off from the remainder of the body; dorsal profile C-shaped and ventral surface of the abdomen flat. Anus ventral, with two small lips. Body hairs about half as long. Integument of AX and of the ventral surface of the thorax with minute spinules in short transverse rows. Labrum deeply bilobed; posterior surface with three isolated and two contiguous sensilla on each lobe. Each mandible with the blade extending to tip of apical tooth and with subapical teeth more rounded. (Material studied: numerous larvae from

California, G. C. and J. Wheeler #27.)

G. C. and J. Wheeler 1970: 145, 148—"Larvae often creamy white with a dirty gray meconium showing through from interior; becoming yellowish, especially at anterior end; semipupae and pupae usually yellow; but brood of same size may be white, yellow, or orange."

Manica hunteri (Wheeler)

Length (through spiracles) about 6.2 mm. Similar to *Manica mutica* (1960a: 5) except as follows. Body more slender. Integument of venter of thorax with minute spinules in short rows. Body hairs of only one type: 0.15-0.32 mm, simple, the longest with slender flexuous tip. Head more evenly rounded. Head hairs 0.072-0.11 mm long, simple. Labrum deeply bilobed; anterior surface of each lobe with four short hairs; ventral border of each lobe with four sensilla; posterior surface of each lobe with four isolated and two clusters of two or three sensilla. Each mandible with blade extending down onto apical tooth.

IMMATURE LARVA: Length (through spiracles) about 4.1 mm. Similar to mature larva except in the following details. Body shape similar to submature larva of *M. mutica*. Body hairs 0.075-0.32 mm and a few on the lateral surfaces of AI-VIII 0.026-0.234 mm, with curled flexuous tip. Mandibles with the apical tooth more curved medially; all teeth sharper. Maxillary palp with eight or nine sensilla each, each galea shorter and stouter. Labial palp represented by a cluster of seven sensilla.

VERY YOUNG LARVA: Length (through spiracles) about 1.8 mm. Similar to mature larva except as follows. Entire integument spinulose, the spinules minute and isolated. Body hairs sparse and simple, 0.009-0.054 mm long. Head hairs about half as numerous and about 0.027 mm long. Each antenna a raised knob bearing three sensilla. Labrum bilobed. Mandibles with the teeth very sharp. Maxillary palp represented by a cluster of seven sensilla; galea represented by two contiguous sensilla. Each labial palp represented by a cluster of seven sensilla.

Material studied: numerous larvae from Montana (#109), Washington (#23, 24) and Wyoming (#184), G. C. and J. Wheeler.

G. C. and J. Wheeler 1970: 153—"The large larvae of *hunteri* are active, flexible and extensible. When the honey-sugar-yolk food was placed near larvae, they fed upon it. Larvae were observed feeding on a dead fly: the mouth parts, which were half-buried in fly tissues, made pumping movements; the mandibles did not move from side to side; when a worker picked up and moved the fly, three larvae remained attached."

Manica mutica (Emery)

YOUNG LARVA: Length (through spiracles) about 4.7 mm. Similar to the mature larva (1960a: 5) except in the following details. Integument of ventral surface of thorax and dorsal surface of posterior somites with minute spinules in short arcuate rows. Body hairs sparse and long. Of two types: (1) 0.11-0.36 mm long; (2) 0.09-0.14 mm long. Head hairs of two types: (1) 0.059-0.12 mm long, stout, with minute denticles; (2) 0.09-0.13 mm long, simple, with slender tip. Labrum deeply bilobed; ventral border of each lobe with about 12 sensilla, but without spinules. Each maxillary palp with nine sensilla. (Material studied: numerous larvae from Wyoming, G. C. and J. Wheeler #183.)

Manica rubida (Latreille)

MATURE WORKER LARVA: Length (through spiracles) about 7 mm. Similar to *M. mutica* (1960a: 5) except as follows. Integument lacks spinules. Labrum bilobed; anterior surface of each lobe with seven sensilla and or minute hairs; ventral border of each lobe with two isolated and three contiguous sensilla; posterior surface of each lobe with seven isolated and two contiguous sensilla. Each mandible with the blade extending down onto the apical tooth.

MATURE SEXUAL LARVA: Length (through spiracles) about 8.5 mm. Similar to mature larva except in the following details. Head relatively smaller; thorax and abdomen more nearly uniform in diameter; prothorax narrowed more abruptly anteriorly to nearly the diameter of the head. Labrum similar to *M. mutica* in shape; anterior surface with 16 sensilla; ventral border with two sensilla and numerous minute spinules; posterior surface of each lobe with about ten sensilla. Each maxillary palp with six sensilla. Each labial palp with six sensilla.

Material studied: two larvae and one semipupa from France, courtesy of Dr. R. E. Gregg.

Le Masne and Bonavita: 1969 - "Comme les Fourmis les plus archaïques (*Myrmecia* d'Australie et *Amblyopone*), *Manica rubida* Latr., qui appartient à la sous-famille évoluée des *Myrmicinae*, fonde ses sociétés sans claustration de la femelle et avec un approvisionnement répété des larves" (p. 2373). Les larves "sont aptes à saisir parfois une proie déposée à côté d'elles, se comportant alors bien qu'à un degré moindre — comme les larves de *Myrmecia* . . . Les larves de *Manica*, comme celles de *Myrmecia*, dépendent moins étroitement des ouvrières que celles des autres Fourmis." (p. 2374.)

Genus *POGONOMYRMEX* Mayr

Cole 1968: 29—"My studies of both North American and South American specimens support the status of *Ephebomyrmex* as a valid subgenus of *Pogonomyrmex*. Moreover, George Wheeler, to whom I sent larvae of *imberbiculus* and *huachucanus*, reported (*in litt.*) that there are no larval characters whatsoever to support a generic status for *Ephebomyrmex*."

Costello 1968: 80—"An excellent photograph of larvae."

Sudd 1967: 123—"Seed-eating ants like *Messor* and *Pogonomyrmex* certainly chew seeds before they give them to their larvae, but they also let them have whole cracked seeds. The larvae thrust their heads into the seeds rather like *Pachycondyla* larvae eating an insect (Goetsch 1953)."

Pogonomyrmex badius (Latreille)

Wilson 1963: 356—"Older mother queens and young larvae . . . are fed exclusively with modified worker-laid 'trophic eggs.'"

Pogonomyrmex hispinosus (Spinola)

Goetsch 1932: 25-26—"Larvae were fed both animal and vegetable foods; pieces of bread and other food were placed among the larvae, which ate them."

Pogonomyrmex carnivora Santschi

Gemignani 1933: 482—"The eucharitid *Thoracantha bruchi* Gemignani was found among the refuse of a nest."

Pogonomyrmex salinus Olsen

Length (through spiracles) about 6.5 mm. Body and head shape similar to *P. barbatus* (F. Smith) (1952: 107). Otherwise similar to *P. occidentalis* (Cresson) (1952: 110) except as follows. Body hairs (1) 0.02-0.09 mm long; (2) 0.175-0.275 mm long; (3) 0.1-0.25 mm long. Head hairs 0.015-0.115 mm long, varying from long with numerous denticles to short without denticles. Antennae with two or three sensilla each. Labrum with anterior surface of each lobe bearing four or five minute sensilla; posterior surface of each lobe with four isolated and two sets of two contiguous sensilla. Mandibles with the teeth shorter and stouter. Each labial palp with two apical, two subapical and one lateral sensilla; an isolated sensillum between each palp and the opening of the sericteries, the latter a short transverse slit. (Material studied: four larvae from Nevada, G. C. and J. Wheeler #543.)

Pogonomyrmex (Ephebomyrmex) imberbiculus Wheeler

Length (through spiracles) about 4.1 mm. Similar to *P. occidentalis* (1952: 110) except in the following details. Thorax more ventrally curved and prothorax slenderer. Integument with spinules in short transverse rows on the ventral surface of the thorax and AI-III and on the dorsal surface of AVI-X. Body hairs of two types: (1) 0.036-0.063 mm long, slender, with minute denticles near the tip, on every somite; (2) 0.027-0.2 mm long, stouter and with more numerous denticles, on the prothorax and AX, and in a ring around the middle of each somite, longest anteriorly. Labial palps with four apical and one lateral sensilla each. (Material studied: numerous larvae from Texas, courtesy of Dr. A. C. Cole.)

Pogonomyrmex (Ephebomyrmex) huachucanus Wheeler

Length (through spiracles) about 5.6 mm. Similar to *P. occidentalis* (1952: 110) except as follows. Type 2 body hairs 0.18-0.25 mm long, with curved shaft and recurved flattened tip, on the ventral surface of all somites. Integument and head shape similar to *P. barbatus* (1952: 107). Labrum width three times the length. Mandibles similar to *P. barbatus* except teeth shorter. Galeae and maxillary palps of the same size. Each labial palp with four apical and one lateral sensilla. Hypopharynx in *P. barbatus*. (Material studied: eight larvae from New Mexico, courtesy of Dr. A. C. Cole.)

Pogonomyrmex (Ephebomyrmex) naegelii Forel

Length (through spiracles) about 4.9 mm. Similar to *P. occidentalis* (1952: 110) except in the following details. Head relatively larger and anterior end not so sharply narrowed. Anus terminal. Body hairs fewer: type (3) about 0.18 mm long, with curled tip and a few denticles, a few on the ventral surface of AIII-VI. Posterior surface of each lobe of labrum with eight sensilla. Each mandible with the lateral portion thick, curved medially and ending in a long narrow round-pointed apical tooth, medial blade bearing two large subapical teeth, medial border erose adjacent of the teeth. Hypopharynx with very few minute spinules in short transverse rows. (Material studied: five larvae from Brazil, courtesy of K. Lenko.)

TRIBE PHEIDOLINI

Genus STENAMMA Westwood

Stenamma manni Wheeler

Length (through spiracles) about 3.4 mm. Similar to *S. diecki* Emery (1953: 50) except in the following details. Body stouter. Body hairs sparse and short. Of two types: (1) 0.03-0.075 mm long, on all surfaces, denticulate to bifid-tipped to deeply bifid; (2) 0.09-0.125 mm long, with single hook, two pairs on each somite (meso- and metathorax and AI-IV). (Material studied: numerous larvae from Mexico, courtesy of Dr. W. L. Brown.)

Genus APHAENOGASTER Mayr
Aphaenogaster (A.) picena Baroni-Urbani

Baroni-Urbani 1971: 37-41—Male and worker larvae described and figured.

Aphaenogaster (Attomyrma) splendida (Roger)

Baroni-Urbani 1968: 419-421—Larvae described and figured.

Aphaenogaster (Attomyrma) flemingi M. R. Smith

QUEEN LARVA: Similar to the worker larva of *A. rudis* Emery (1953: 56) except as follows. Entire integument with minute spinules in short transverse rows. Body hairs very sparse, (1) long (0.084-0.168 mm), with slender flexuous tip; (2) about 0.096 mm long, with bifid tip. Head hairs 0.046-0.096 mm long, simple, flexuous. Antennae each a low elevation. Anterior surface and ventral border of labrum without spinules.

MALE LARVA: Similar to the worker larva of *A. rudis* (1953: 56) except as follows. Body hairs more numerous than on the queen. Of two types: (1) 0.06-0.144 mm long, simple, the longest with flexuous tip; (2) 0.036-0.084 mm long, with branched tip. Head hairs 0.036-0.072 mm long, with bifid tip.

Material studied: two semipupae from Louisiana, collected by Dr. John C. Moser.

Aphaenogaster (Attomyrma) megommata M. R. Smith

Length (through spiracles) about 4.9 mm. Similar to *A. rudis* (1953: 56) except in the following details. Neck more sharply demarcated and gaster more swollen. Body hairs of only one type: 0.013-0.1 mm long, with dichotomously branched or frayed tip. Head hairs 0.025-0.05 mm, simple or with the tip short-bifid or dichotomously branched. Labrum with fewer spinules on the posterior surface near the ventral border.

SEXUAL LARVA: Length (through spiracles) about 5.1 mm. Similar to worker larva except as follows. Body hairs 0.12-0.24 mm long, with the tip branched and the branches denticulate or branched. Antennae with three to five sensilla each (usually four).

Material studied: numerous larvae from Nevada, G. C. and J. Wheeler, #731.

Aphaenogaster (Nystalomyrma) longiceps F. Smith

MATURE WORKER LARVA: Length (through spiracles) about 6.1 mm. Very similar to *A. rudis* (1953: 56) except in the following details. Body shape with the venter of AII-VIII flatter. Integument without spinules. Body hairs sparse; of one type: 0.075-0.25 mm, with the tip attenuated. Head hairs simple, 0.054-0.11 mm long. Medial teeth of mandibles smaller. Each labial palp a cluster of five sensilla.

YOUNG LARVA: Length (through spiracles) about 2.4 mm. Similar to

mature worker larva except in the following details. Body with ten differentiated somites. Entire integument spinulose, the spinules minute and isolated or in very short rows. Head capsule similar to second instar larva of *A. rudis* (1953: 57). Anterior surface of each lobe of labrum with eight very short hairs and or sensilla. Mandibles with all teeth sharper.

QUEEN LARVA: Length (through spiracles) about 12 mm. Similar to worker larva of *A. rudis* (1953: 56), except in the following details. Head hairs about half as numerous, simple, 0.054-0.14 mm long. Anterior surface of each lobe of labrum with three or four minute hairs but no sensilla.

MALE LARVA: Length (through spiracles) about 6 mm. Similar to worker larva of *A. rudis* (1953: 56) except in the following details. Body hairs all simple, 0.15-0.26 mm long. Integument of posterior somites with minute spinules in short arcuate rows. Head hairs about half as numerous, simple, 0.054-0.14 mm long. Anterior surface of each lobe of the labrum with 9-10 minute hairs and/or sensilla. Medial teeth of mandibles smaller.

Material studied: numerous larvae from New South Wales, courtesy of Rev. B. B. Lowery.

Aphaenogaster (Nystalomyrma) pythia Forel

Length (through spiracles) about 4.7 mm. Thorax forming a slender curved neck; abdomen inflated and bag-like, with the ventral profile straight and the dorsal profile C-shaped. Anus ventral, with a posterior lip. No spinules on the integument. Body hairs sparse. Of one type: 0.16-0.23 mm long, simple, with very long flexuous tip. Head hairs about half as numerous, 0.05-0.18 mm long, simple, with a slender base and an attenuated apical half. Posterior surface of each lobe of labrum with two isolated and a cluster of three or four sensilla. Maxillary palps and galeae more slender. Otherwise similar to *A. rudis* (1953: 56). (Material studied: numerous larvae from New South Wales, courtesy of Rev. B. B. Lowery.)

Genus MESSOR Forel

Goetsch 1930: 387—The growth of the larvae is favorably influenced by animal food.

Sudd 1967: 123—See *Pogonomyrmex*.

Messor barbarus (Linnaeus)

Goetsch 1930: 387—Simple outlines of larvae in profile.

Mursaloglu 1957: 92—The larvae are always milky white; they are hairy.

Genus NOVOMESSOR Emery *Novomessor cockerelli* (E. Andre')

SUBMATURE MALE LARVA: Length (through spiracles) about 6.6 mm. Similar to *N. albisetosus* (Mayr) (1953: 70 and 1960a: 8) except in the following details. Thorax less swollen. Body hairs of three types; (1) 0.038-0.15 mm long, tip short-bifid or denticulate, generally distributed; (2) 0.075-0.19 mm long, base heavier, tip variously branched and denticulate, in a ring around each somite; (3) 0.11-0.18 mm long, with bifid recurved tips, in a ring around each abdominal somite. Head hairs moderately numerous 0.05-0.11 mm long, simple or with the tip finely denticulate. (Material studied: four larvae from Dr. P. B. Kownowski, locality unknown.)

Genus VEROMESSOR Forel

New material in this genus necessitates a revision of our 1960b key: page 109, Group D, part I should be replaced by couplets 6-9 of the above key.

Veromessor andrei (Mayr)
(Fig. 8 and 9)

Length (through spiracles) about 6.6 mm. Similar to *V. lobognathus* (Andrews) (1956: 143) except in the following details. Body of more nearly uniform diameter, abdomen less swollen. Body hairs of one type: 0.075-0.188 mm long, with minute denticles along a simple shaft or the shaft flattened. Head hairs 0.073-0.14 mm long, with short-branched tip. Anterior surface of each lobe of labrum with about six sensilla. Apical tooth of each mandible less curved. (Material studied: seven larvae from California, courtesy of R. R. Snelling.)

Veromessor chamberlini (Wheeler)

MATURE LARVA: Length (through spiracles) about 5 mm. Similar to *V. lobognathus* (1956: 143) except in the following details. Body of a more nearly uniform diameter. Entire integument with minute spinules. Body hairs 0.09-0.22 mm long, all denticulate. Head hairs 0.054-0.09 mm long, denticulate.

YOUNG LARVA: Length (through spiracles) about 2.4 mm. Similar to the mature larva except in the length of the body hairs: 0.05-0.18 mm long.

Material studied: ten larvae from California, courtesy of R. R. Snelling.

Veromessor pergandei (Mayr)

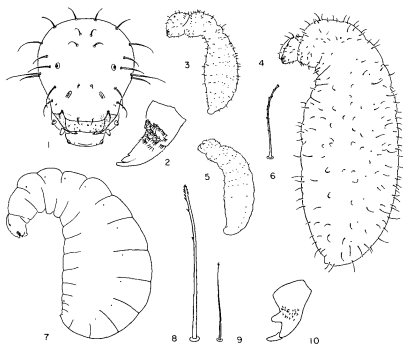
MATURE LARVAE: Lengths (through spiracles) about 4.8 and 5.3 mm. Similar to *V. lobognathus* (1956: 143) except in the following details. Integument of thorax and anterior abdominal somites with a few minute spinules. Body hairs 0.038-0.11 mm long, denticulate. Head hairs with the tip branched (usually bifid). Each mandible with the apical tooth more curved medially, only one subapical tooth. (Material studied: numerous larvae from California, courtesy of E. S. McCluskey.)

Veromessor smithi Cole

Body length (through spiracles) about 5.4 mm. Similar to *V. lobognathus* (1956: 143) except in the following details. Abdomen less swollen. Body hairs of three types: (1) 0.054-0.16 mm long, with denticulate tip, on all somites; (2) 0.027-0.13 mm long, with short-bifid tip, on all somites; (3) 0.11-0.19 mm long, with short-bifid tip, in a ring around each somite. Head hairs 0.018-0.08 mm long, simple or with bifid, trifid or multifid tip. Each mandible with the subapical tooth longer and the proximal tooth blunter. (Material studied: five larvae from Nevada, courtesy of Dr. A. C. Cole.)

Genus MACHOMYRMA Forel

Plump, chunky and subellipsoidal; head ventral, near the anterior end, mounted on a small short neck formed from the prothorax; anterior end broadly rounded, formed from the dorsa of the pro- and mesothorax; posterior end narrowly rounded. Body hairs sparse, of one type, short to long, denticulate. Head hairs few, short to long, with the tip denticulate. Posterior surface of



Machomyrma froggatti Forel. 1-6. 1, head in anterior view, X113; 2, left mandible in anterior view, X389; 3, very young larva, about 1.3 mm long, in side view, X27; 4, mature larva in side view, X27; 5, youngest larva, about 1.1 mm long, in side view, X27; 6, body hair, X235. *Manica bradleyi* (Wheeler). 7, submature larva in side view, hairs omitted, X21. *Veromessor andrei* Mayr. 8 and 9, two body hairs, X185. *Pheidole brevicornis* Mayr. 10, left mandible in anterior view, X222.

labrum densely spinulose, the spinules arranged in numerous arcuate rows. Mandibles small, aphaenogastriform (i.e. subtriangular in anterior view, apex forming a moderately long slender tooth which is curved medially, medial border with two subapical teeth, the proximal small); middle third of anterior and posterior surfaces with long spinules in short arcuate subtransverse rows. Maxillae with a few spinules on the apex. Anterior surface of the labium rather densely spinulose, the spinules minute and in arcuate rows. Hypopharynx densely spinulose, the spinules long and in transverse rows.

In our key (1960: 109) *Machomyrma* will run to couplet C3. It may be distinguished from *Pheidole* by its aphaenogastriform mandibles and its lack of anchor-tipped hairs.

Machomyrma froggatti Forel

(Fig. 1-6)

MATURE WORKER LARVA. Length (through spiracles) about 2.9 mm. Profile pheidoliform (i.e., short and stout, head ventral, near the anterior end, mounted on a small short neck formed from the prothorax; anterior end broadly rounded, formed from the dorsa of the prothorax and mesothorax; gaster straight; posterior end narrowly rounded; anus subterminal, with a posterior lip. Integument with minute spinules, most numerous and in short transverse rows on the anterior somites, becoming sparser posteriorly. Body hairs sparse, short to long (0.018-0.18 mm), denticulate. Cranium subpyriform in anterior view. Antennae small, each with three sensilla, each of which bears a minute spinule. Head hairs few, short to long (0.025-0.08 mm), with the tip denticulate. Labrum small, short and broad (breadth nearly three times the length); subrectangular; anterior surface with about 12 sensilla near the ventral border, the latter with numerous minute spinules; posterior surface densely spinulose, the spinules arranged in numerous arcuate rows; posterior surface with two isolated and two contiguous sensilla near each ventrolateral corner. Mandibles small, heavily sclerotized, narrowly subtriangular in anterior view; aphaenogastriform (apex forming a slender tooth which is curved medially with two blunt subapical teeth on the medial border, the proximal small); middle third of anterior and posterior surfaces with long spinules in short arcuate subtransverse rows. Maxillae rather small; the apex paraboloidal and bearing a few short rows of minute spinules; each palp a small skewed peg with four apical and one lateral sensilla, the last with a rather long spinule; each galea a short peg with two apical sensilla. Labium spinulose, the spinules minute and in arcuate rows; each palp a cluster of five sensilla, one of which bears a rather long spinule; an isolated sensillum between each palp and the opening of the sericteries, the latter a transverse slit. Hypopharynx densely spinulose, the spinules long and arranged in transverse rows, which are so close together that the spinules overlap.

YOUNG LARVA: Length (through spiracles) about 1.8 mm. Diameter of body decreasing from AIV and AV toward both ends. Anus terminal with a small posterior lip. Integument of ventral surface of anterior somites and dorsal surface of posterior somites with minute spinules, isolated or in short transverse rows. Body hairs sparse, 0.025-0.175 mm long, denticulate, on all somites, a ring of the longest around the middle of each somite. Head hairs 0.03-0.075 mm long. Otherwise similar to the mature larva.

VERY YOUNG LARVA. Length (through spiracles) about 1.3 mm. Pro- and mesothorax bent ventrally, remainder of body straight; posterior end curved ventrally; AX forming a small posteroventrally directed knob; diameter of metathorax and A1 smaller; diameter of AIV and AV greater; diameter of pro- and mesothorax about the same as the head. Anus ventral. Integument sparsely spinulose, the spinules minute and isolated or in very short rows. Head hairs 0.025-0.05 mm long. Each mandible with the apex short and rounded, subapical tooth small. Each maxillary palp a low knob; each galea a short skewed peg. Labium minutely spinulose. Otherwise similar to mature larva.

YOUNGEST LARVA. Length (through spiracles) about 1.1 mm. Diameter of body nearly uniform and slightly curved ventrally; AX forming a prominent terminal knob. Body hairs confined to the thorax and AI-IV, becoming scarcer posteriorly and confined to venter of AIII-IV; length 0.06-0.34 mm, the shortest few and simple, the longest with tip denticulate or multifid. Head hairs 0.019-0.03 mm long. Labrum with fewer sensilla on anterior surface; spinules on posterior surface minute. Mandibles feebly sclerotized; with sharp teeth and without

spinules. Each maxillary palp smaller; each galea represented by two contiguous sensilla. Labium with minute spinules. Hypopharynx minutely spinulose. Otherwise similar to mature larva.

Material studied: numerous larvae from New South Wales, courtesy of Rev. B. B. Lowery.

Genus PHEIDOLE Westwood

Brown and Taylor 1970: 954—Figure of a larva in side view.

Pheidole brevicornis Mayr (Fig. 10)

Length (through spiracles) about 2.3 mm. Similar to *Pheidole dentata* Mayr (1953: 71) except in the following details. Anchor-tipped hairs about 0.32 mm long, with only two on each somite. Anterior and ventral surfaces of labrum with short rows of minute spinules. Mandibles with blunt teeth; apical tooth curved medially, subapical tooth anterior to apical tooth and directed ventrally, basal tooth curved medially and posteriorly; a few coarse spinules posterior to subapical and basal teeth. Each maxillary palp and galea subcylindrical. (Material studied: numerous larvae from New South Wales, courtesy of Rev. B. B. Lowery.)

Pheidole californica Mayr

Length (through spiracles) about 2.1 mm. Very similar to *Ph. dentata* (1953: 71) except in the following details. Body hairs sparse; of two types: (1) 0.025-0.1 mm long, with short-to long-bifid tip, on all somites; (2) anchor-tipped, about 0.2 mm long, two each on dorsa of AI-V. Head hairs 0.03-0.045 mm long. Each lobe of labrum with two or three minute hairs and/or sensilla; ventral border with only one sensillum and numerous spinules. (Material studied: eight larvae from Nevada, G. C. and J. Wheeler #187.)

Pheidole guilelmimuelleri Forel

WORKER LARVA. Length (through spiracles) about 3.6 mm. Thoracic and AI spiracles larger than the remainder. Similar to *Ph. dentata* (1953: 71) except in the following details. Body hairs longer: (1) 0.05-0.125 mm long; (2) about 0.1 mm long; (3) about 0.45 mm long. Ventral border of labrum with spinules in short rows medially; posterior surface with the spinules in short rows arranged concentrically around the ventral notch, dorsally the rows become transverse. Each maxillary palp digitiform (taller than the galea) with one apical (encapsulated), three subapical and one lateral sensilla.

QUEEN LARVA. Length (through spiracles) about 4.7 mm. Body shape similar to that of *Ph. dentata* male larva (1953: 73). Otherwise similar to worker larva except as follows. Head hairs 0.05-0.075 mm long, simple or with short-bifid tip. Each mandible with the anterior spinules smaller and not so numerous. Maxillae without spinules; each palp chair-shaped with four apical and one lateral sensilla; each galea a frustum with two apical sensilla.

MALE LARVA. Length (through spiracles) about 3.6 mm. Body shaped similar to soldier of *Ph. dentata* (1953: 72) otherwise similar to worker except in the following details. Body hairs longer: (1) 0.05-0.12 mm long; (2) about 0.125 mm long; (3) about 0.45 mm long. Head hairs 0.03-0.056 mm long. Labrum

similar to that of worker (see above). Mandibles with spinules on the anterior surface longer.

Material studied: numerous larvae from San Paulo, Brazil, courtesy of K. Lenko.

Pheidole hyatti Emery

WORKER LARVA: Length (through spiracles) about 2.5 mm. Very similar to *Ph. dentata* (1953: 71) except in the following details. Integument of ventral surface of the anterior somites and dorsal surface of posterior somites sparsely spinulose. Body hairs of slightly different lengths: (1) 0.025-0.087 mm long; (2) 0.062-0.137 mm long; (3) about 0.275 mm long. Head broader dorsally. Antennae sometimes with four sensilla. Anterior surface of labrum with four sensilla on and near the ventral border. Maxillae without spinules; each labial palp taller and with four apical and one lateral sensilla.

SEXUAL LARVA: Length (through spiracles) about 6.1 mm. Similar to *Ph. dentata* male (1953: 73). Entire integument spinulose, the spinules minute and in short transverse rows. No body hairs seen. Head small; transversely subelliptical; head hairs minute (0.008-0.012 mm long), simple.

IMMATURE SEXUAL LARVA. Length (through spiracles) about 3.1 mm. Body sac-like (see *Ph. dentata* 1953: 73). Similar to the worker except as follows. No spinules on integument. Body hairs very few, mostly on the pronotum, 0.012-0.05 mm long, very fine, simple. Head hairs 0.012-0.05 mm long, simple.

Material studied: numerous larvae from California, G. C. and J. Wheeler #389 and #693.

Pheidole micula Wheeler

Length (through spiracles) about 2.4 mm. Very similar to *Ph. dentata* (1953: 71) except in the following details. Integument with spinules on the ventral surface of the anterior somites and the dorsal surface of the posterior somites. Head hairs shorter (0.008-0.016 mm long). Anterior surface of each lobe of labrum with two minute hairs and/or sensilla, ventral border of each lobe with one isolated and two contiguous sensilla. (Material studied: 15 larvae from California, G. C. and J. Wheeler #374.)

Pheidole moerens Wheeler

Length (through spiracles) about 1.4 mm. Very similar to *Ph. dentata* (1953: 71) except in the following minor details. Body hairs: (1) 0.025-0.083 mm long, with short-bifid tip, generally distributed; (2) 0.025-0.075 mm long, deeply bifid, generally distributed; (3) about 0.225 mm long, anchor-tipped, a pair each on A1-V. Head hairs 0.025-0.037 mm long, with the tip simple to four-branched. Labrum with two sensilla on anterior surface of each lobe. Maxillae without spinules. (Material studied: numerous larvae from Puerto Rico, courtesy of R. J. Lavigne.)

KEY TO THE MATURE WORKER LARVAE
IN OUR COLLECTION

- 1a. Profile pheidoliform (C3, 1960b: 106) 2
- 1b. Profile myrmiciform (D4, 1960b: 106) 3
- 1c. Profile aphaenogastriform (D4, 1960b: 106) 6

- 2a. Mandibles pheidoliform (IIIc, 1960b: 108); anchor-tipped hairs present *Pheidole*
- 2b. Mandibles aphaenogastriform (IA, 1960b: 107); anchor-tipped hairs absent *Machomyrma*
- 3a. Anchor-tipped hairs present *Myrmica*
- 3b. Anchor-tipped hairs absent 4
- 4a. Mandibles messoriform (Vd, 1960b: 108) *Messor*
- 4b. Mandibles pogonomyrmeciform (Id, 1960b: 107) *Pogonomyrmex*
- 4c. Mandibles leptothoraciform (IIc, 1960b: 107) 5
- 5a. Anterior surface of mandibles spinulose *Manica*
- 5b. Mandibles without spinules *Paramyrmyca*
- 6a. Without spinules on anterior surface of mandibles *Novomessor*
- 6b. Anterior surface of mandibles spinulose 7
- 7a. Without deeply bifid body hairs (except *V. lobognathus*); head and body with denticulate hairs *Veromessor*
- 7b. Deeply bifid body hairs present 8
- 8a. Deeply bifid body hairs with the branches rather stout and recurved at the tip *Veromessor lobognathus*
- 8b. Deeply bifid body hairs with the branches slender and flexuous 9
- 9a. Head hairs deeply 2- to 4-branched (usually 2-branched), rarely denticulate *Stenamma*
- 9b. Head hairs simple or with the tip bifid or denticulate *Aphaenogaster*

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